Placement in Open University By Virtual Environment and Robotics

Gaetano Raiola Ph.D.

University of Salerno, University of Basilicata, Italy
Email: raiolagaetano@libero.it

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Abstract:The aim of this study is to investigate on new models for internships works in undergraduate courses in physical education and sport into the Italian university. Actually, because of the specificity of motor sport activity the practice must be taught as placement in sport facilities or into professional structure. To achieve the goal of education and in compliance of the law, placement and internships work must respect specific parameter. In open university, the online aspects and related methods have primary importance and every subject have to teach in same way. Thus, because of the placement is very particular subject it could be taught in the same manner as well as the others, otherwise the open university must try other solution as to establish a special agreement with sport institution as required by the law. On the other hand it occurs a controversial application of the law prescription and to utilize the mixed mode to teach: in presence mode for a part of education (placement) and on line mode for the other part of the education. The solution must be found in other fields of knowledge such as computer science, virtual environment and video games that use the motor control theory trough a specific technology system. Particularly, robotics and virtual environment and their applications in wide field of motor activities could give a right response for a new mode of internship work called e-placement.

Keywords: hapitcs, audio-vision, vibrotactile, education, internships work

1. Introduction

In Italy the public non state and open university has established and implemented in compliance with Minister Decree of 1st March 2004 of the Ministry of Education, University and Research the online under and post graduate course. It provides a high quality education through the use of innovative communication technologies which implement a continuous learning process without any limit of space or time. The Open University adopts an innovative learning modalities by developing research strategies for most advanced technological solutions and by integrating non residential communication tools such as e-learning, videoconference, mobile learning and completed with in presence special activities as workshops and seminars. These online activities have replaced every subject that doesn't need of any special law obligation for the expertise of the students in superior education in physical education and sport. However the Open University could also implement the under and postgraduate degree in physical education and sport because of the non obligation with in presence activities. In this way the Minister Decree on undergraduate course and master degrees gives a great importance to a specialization activity according to the literal declaration: " the special purposes, the curricula of degree courses of the physical activities and sport class provide, in relation to specific objectives, the deepening of some lessons and activities, with placements in facilities, training and sport organizations, businesses, public administration structures and laboratories, in addition to visits of study at other Italian and foreign universities, including in the framework of international agreements" (DM 270/2004). Afterwards the new minister decree 16 March 2007 on bachelor and master degrees gives more importance than the last one, which gives not less of 25 University Credits in physical education and sport as literally wrote: " …. in the form of internships and practical work conducted in appropriate facilities for dimensions and specifications provided for the activity and the number of students." (DM 16 March 2007). First of all, the problem is how the open university can realize the online activities without the real with in presence activities. Secondly, how could be solved the problem with a take place a practical activity with in presence mode and training skills whatever the mission of open university is the application of new

technologies by on line mode. Finally, what is the best way to involve the new technologies theory in compliance with the law and to give an optimum educational offer to students and, so, how it is possible to solve a controversial application of the laws with the mix mode teaching: in presence activity and in distance one. The current study can useful to the field of virtual environment and robotics and this scientific field has been used for 15 years as a good methodology to obtain specific progress in various fields. It serves as an enhanced platform, which replays as realistically as possible. Such simulators represent to the trainee only the scenarios' feedback and the physical constraints related to a specific task without any particular knowledge on how the task should be performed. Daniel Gopher of the Israeli Institute of Technology, professor of cognitive psychology and human factors engineering and holding the Yigal Alon chair for the study of human at work studies computer games as a training environment for complex skills, says : "the old simulators and modern virtual reality training environments have been developed to train operators in the performance of tasks when on the job training is impossible, difficult, or very expensive. However, these simulated environments have their own drawbacks and costs." (Gopher et al. 2005). Consequently the virtual scenarios passively assists the trainee who is trained by the technology platform. The training of skills requires that additional information will be modeled within the virtual environments and in the control of its interfaces (Avizzano et al. 2008). Actually this methodology gives the representation of the information and stimuli generation will be presented and specific applications to haptics, audio, vision and vibro-tactile (Bergamasco et al. 2003). The aim of this study is to investigate on new models for internships works in undergraduate courses in physical education and sport into the Italian university. The placement is very particular subject it could be taught in the same manner as well as the others, otherwise the open university must try other solution as to establish a special agreement with sport institution as required by the law. So it investigates on alternative way to make the placement in correct and better way.

2. Methods

This research needs a complex and integrated method that follows the step mode process for implementing an unique process. These steps are several and come from different research field approach, but they have finalized in a coherent path that will arrive at the same final point. The line research needs an argumentative theoretical study in two way. First, documental research with the juridical approach to analyze and examine the rules for accreditation of university study and the rules of open university. To verify the whole application of combination of them to give a solution of the problem. Secondly, basic research on new technologies on virtual environment and its form to interface in human movement. Finally, the integrated approach takes place between the last ones to examine the compatibility of the compliances of the law and of the new technologies in university system.

3. First Activity

Examining the contents of the four laws, among the principal ones and investigate the relationship among them and, finally, to identify the combined applications to give a correct execution to resolve the question.

1. Minister Decree 4 august 2000 literally reads : "For the special purposes, the curricula of degree courses of the physical activities and sports class provide, in relation to specific objectives, the deepening of some lessons and activities listed, with placements in facilities, training and sports organizations, businesses, public administration structures and laboratories, in addition to visits of study at other Italian and foreign universities, including in the framework of international agreements" has the duty to implement a complete course of job placement or other similar activities to ensure the regular process .
2. Afterwards, according to Minister Decree 16/3/2007, it needs 25 University Credits Formation in physical and sport activities. This decree reads : "The physical and sport disciplines are conducted for a number of not less than 25 CFU in the form of internships and practical work conducted in appropriate facilities for

dimensions and specifications provided for the activity and the number of students." The problem is how the open university can realize the course degree on-line the real with in presence activities and so it could be solved with practical activities with training skills by virtual environments trough a video game e-learning system.

3. Law 289 27 December 2002 comma 5 art 26 literally reads "By decree of the Minister of Education, University and research, by agreement with the Minister for Innovation and technology are certain criteria and procedures for accreditation of university courses and distance education institutions empowered to grant degrees, under the regulation in the Decree of the Minister of Universities' and scientific research and technological November 3, 1999, n. 509, at the end of the course itself, without charges on the state budget. The acquisition of the authorization to issue degrees, the institutions must have adequate organizational resources and management able to:

a) present a system architecture for flexible and capable to target the different technologies for the management of interactivity, preserving the principle of their usability;
b) encourage the integration of coherent and educationally valid range of support services to teaching delivered;
c) ensure the selection, design and drafting of appropriate resources for each learning courseware;
d) ensuring appropriate contexts of interaction for the administration and management of the flow of learning content, including through the provision of a structured service tele tutoring;
e) to ensure appropriate assessment procedures of knowledge according to the certification of acquired skills and competences, to ensure research and development of innovative architecture of el-earning system that supports the flow of multimedia data related to the range of learning offered products".

4. Article 8 commas 2 of Decree April 17, 2003 - Criteria and procedures for accreditation of courses of distance learning universities state and non-state universities and institutions authorized to issue licenses academic - "Instances for the accreditation of university courses at a distance of Telematic (Open) universities that require, for the pursuit of specific objectives training, special training and practical activities, which are governed by provisions of law or European Union, or involving the frequency of laboratories to highly specialized, will be assessed after the conclusion of special agreements with the University of state and non state"

By reading these laws, it compliances to implement a correct way to make a placement planning for under and post graduate course in total respect and its mission statement of the open university. We are going to find a solution for these academic activities and to adopt the correct process in comply to law.

4. Second Activity

To analyze the current scientific discovery about perception and virtual application of on body movement and its applications on physical education and sport science. The innovation opportunities are arising from the close collaboration between humans and active environment (David Husserl 1925, Maurice Merleau Ponty 1945 two the greatest philosopher on mind function theory) that increasingly characterizes modern society that means the current theory of Phenomenology of the mind and Perception. This phenomenon, that is enriched and reactive environment, is embodied in very different forms, firstly virtual environments, robots, and the performances go well beyond human limits for example to access and manage great amounts of information. To bring to fruition these capabilities, we have to bring and improve the life quality of us, including the best forms of our job, it must be ultimately driven by human will that follows the intuitive and natural way. So we leave freely to give a maximum effort to machine throughout the appropriate degree of autonomy. The sense of sight, and hearing by eyes, hears, body and kinesthesia, is the interface base for a natural interaction with the external environment. It requires an improvement of the traditional human-machine. The real transmission of the information to the senses must be increased and, in at the same time,

new communication modes must be elaborated that build on the human ability to transmit and receive physical cues like gestures, force and tactile stimuli. For this reason we have to conceive and develop Advanced Interaction Concepts and Technologies for improving the communication between the humans and the reactive environment, with special attention to Virtual Environments and Tele-Robotic Systems. The scientific objective is to research on Advanced Interaction Methodologies and Technologies as well as on their usability in specific application domains. These are the following interaction technologies that will have to investigate in this way:

- Haptics - Both Hardware and Software technologies relating to the sense of touch (force and tactile feedback) by artificial stimulations and to the communication of manual, handling and body skills. The goals of the findings are the development of advanced Haptic Interfaces, efficient collision detection modules and real-time renderers of the behavior of rigid and deformable objects.
- Motion Trackers - Technologies for the real-time acquisition of the movements of the human limbs, with a special focus on the development of flexible structures having continuous distribution of the degrees of freedom.
- Extenders - Both Hardware and Software technologies and techniques for the development and empowerment of robotic systems, able to improve the outcomes of singular motion gesture.
- Motion Platforms - Methodologies for the optimum design of movement platforms throughout the useful algorithms for the optimizing of the inertial cues.
- Unmanned Vehicles - Development of advanced algorithms and special software technique for the semi-autonomous navigation of vehicles in unstructured environments.
- Stereoscopic Visualization Systems -Advanced of special software techniques for the real time optimizing of complex scenes on stereoscopic multi-wall displays.

The current usability of the interaction of the technologies is investigated and is more going to investigate in various application domains: Engineering, Architecture and Design, Surgery and Rehabilitation, Static and Dynamic Simulation, Industrial Maintenance, Automotive and Aerospace, Education and Training, Cultural Heritage, Art and Craftsmanship, Sport and Entertainment.

5. Results

The first activity shows the whole incongruent of the online procedure applied to under and postgraduate course for a placement with in presence activity because this application is in real contrast to the mission of open university that is full immersion in new technologies and not part time. On the other hand to establish the agreement with other state and non state university whose in presence activity makes a mistake for two questions: 1)Why the other university should collaborate to resolve the problem of internship work when this is the difference between open and state university? 2)Why the students, that have chosen the open university because of the opportunity to study online, now should accept the in presence activity? Finally, the compliance of the specific laws of open university does not allow the correct function in double mode of placement with in presence and without, and then it is not easy to agree with other universities. About the second activity, it shows a new way to consider the human movement under the profile of qualitative aspects more important than quantitative aspects of motor control and perception. Special tools, as haptics, with its kinesthetic haptic interfaces, and tactile actuators could be the properly solution for the activity that is both with in presence and without physical presence. Particularly, with the term haptics we refer to a set of hardware and software technologies able to elaborate in a way different from the human mind, and so to elicit in the humans' physical perceptions through the sense of touch. Haptics is an match between human and machine by interaction technology that promises to greatly improve the communication capability with remote and/or virtual worlds, adding the sense of touch to the communication channels, beside the conventional ones based on the hearing and sighting sense. Reflecting to the humans the physical stimulations arising from the contact with virtual or remote objects allows a natural control of the interaction, during, for example,

the execution of manipulative or exploration tasks. Differently from the case of visual and audio communication, the optimizing of the physical sensation relating to the sense of touch requires the set-up of a two way real-time communication with the remote or virtual world. Indeed, the physical stimulations of the haptics sensorial system is a direct consequence of the actions performed on the environment. From the technology point of view, the research is primarily focused on the identification and development of suitable sensing and actuation technologies able, from one side, to acquire the movements of the human limbs, that are fed as an input to the system, and, from the other side, to fed to the human the corresponding stimulations, as an output from the system. The devices able to embody these two basic functionalities are named Haptic Interfaces. The research on virtual world is focused in the development of mathematical models and related computing architectures and techniques, able to evaluate in real time the response of the environment to the actions of the human. The set of these software technologies are indicated with the generic term of Haptic Rendering. Furthermore Kinesthetic Haptic Interfaces (KHI) are a class of haptic interface able to exert controlled forces on the human body using as an End Effectors a passive connection part that is permanently in contact with the limb(s) of the operator during both the time in which no contact with the Kinesthetic Haptic Interfaces (KHI) are a class of haptic interface able to exert controlled forces on the human body using as an End Effectors a passive connection part that is permanently in contact with the limb(s) of the operator during both the time in which no contact with the remote or virtual object is established and the time in which the contact is established. The connection part can imitate the shape of a specific tool, like for example a cutters, or be conformed to adhere to the limb surface, like for example in the case of a thimble. KHI allows a satisfactory simulation of interaction with objects that are mediated by the interposition of specific tool (case of indirect contact), as for example in the case of the simulation of a surgical procedure, even if they are currently used also for the simulation of direct contact with the objects. Due to their working principle, i.e. the fact that the device is permanently attached to the operator, a special care has to be devoted to their mechanical design and to the development of their low level controller in order to guarantee the exertion of low resistance forces felt by the operator during his/her free movements (i.e. when no contact with the remote or virtual object is established). This quality of the KHI is indicated as “transparency” of the KHI and it translates in a set of mechanical performances evaluated at the end effectors of the device such as low reflected inertia, low friction and little backlash. Other performances are used to assess the quality of a KHI, such as stiffness and bandwidth that refer to its ability to reproduce statically stiff environment and fast evolving events such as shocks or collision. They said performances of a KHI deeply depend on the kinematics of the device, the positioning and the selection of the basic components of the actuation system and the material and geometry of the links as well as by the gravity, friction and inertia compensation techniques used in the low level controller. Finally, the tactile actuators are systems that are involved in several application fields (medicine, industry, entertainment, cultural heritage) with purposes of training, rehabilitation, simulation and so on. The full immersion, or the "being there" feeling, depends on the richness and complexity of the set of sensorial stimuli that the user receives from the VR device. The sense of Touch is one of the most important in simulation of object exploration and manipulation. Goals of this research activity are the definition of a reference configuration for a Tactile Actuator and the definition of the design procedure and the implementation tools needed for. The Actuator will be able to stimulate the external perception sensors in the fingertips in order to replicate a tactile perception like the one you feel when you explore and/or maniple an object in the real world.

6. Conclusion

The principal goal of this study is to create an integrated objective for a stable connection of researches and investigation coming from different multidisciplinary fields, such as juridical science, economical science, virtual environments, Robotics, Neuroscience, Didactics, Computer Science, with the aim of defining the foundations of a newer and future oriented research field for the development of active interfaces to

implement a new educated way for a university. Dinesh K. Pai 2009 said that: "Sensor motor computation forms the bridge between abstract information processing in the human brain and the concrete reality of the physical world. It studies how the brain perceives the state of its external environment (using exteroceptive sensors such as vision and touch) and the state of its own body (using proprioceptive sensors such as muscle spindles and the vestibular organs), and takes action by controlling muscles." We can use this phrase to open new frontiers for education. Cognitive sciences are experiencing a great development in the scientific community; they are more and more frequently applied to research on aesthetic fruition and creative processes. Perception, neurosciences and neurobiology play a central role in fruition; this research line aims to provide information about perceptual mechanisms activated when going through an aesthetic experience – such as a work of art – and during interaction with Virtual Environments.

Based on this theoretical framework, and on established knowledge acquired in relevant VE projects, the group works at developing techniques and methodologies to design and evaluate virtual experiences. Finally, the perspective of using computer games in virtual environment to educate and train of complex skills is in the large diffusion also for mental training method in high performance. It gives examples from the development of an attention trainer for piloting skills, cognitive trainer for basketball, volleyball and, a recent effort to develop a cognitive trainer, ice hockey. If this teaching method and useful tools are good for high sport performance why isn't it used in education and training for teachers and coaches? The current theory of motor control system has a significance analogy with the mechanisms and processes of these technologies, particularly the closed loop theory by Jack Adams and the open loop theory by Richard Schmidth give some practice responses to how the mind can work when it has merged in virtual environment. Actually the motor imagery theory, that is the theory that substances the mirror neurons system in those movement that needs of anticipating decision. Furthermore it talks on the other theory system that is the future development in the virtual environment. With an appropriate educating and training it can uses the neural network theory. It is possible to establish deductive rules of an expert system for the prediction of the opponent's move in a direct confrontation for the fight activities and sports game. Training enables students to use the motor schemes that they acquired during their training (perceptual affordances). The students will reproduce - with growing precision - athletic gestures that allow performing certain actions during the activity. The increasing increment of the accuracy in the execution irreparably leads to a decrease in the movement flexibility because - in order to achieve the expected result - it can not coexist with different execution modalities. The students can use the expert system and the use of it is useful to simulate the opponent's possible actions and prevent their effects. An expert system is a program that can implement inference procedures in response to a problematic situation. The purpose of an expert system is to provide an answer to the problem. In this sense the rigidity models the response situation of the student over time. More specifically, an expert system requires a set of well-defined rules, in order to build logical sequences that lead to the identification of the solution. Finally it is possible to discuss in order to plan the virtual environment in education for physical education and sport.

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